RESEARCH PAPER

Do Forest Values Influence Compliance with Forestry Legislation? The Case of Farmers in the Fringes of Forest Reserves in Ghana

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Abstract   Forest values play an important role in forest management practices, and in the design and implementation of forest policy and the legal framework. This paper assesses the importance of farmers' forest values and the potential associations between farmers' forest values and their compliance with the tree-felling rule in Ghana. The results are derived from a survey with farmers, inhabiting fringes of forest reserves in the High Forest Zone of Ghana. With the exception of the forest value for future generations, forest values that contribute to immediate subsistence and livelihoods are perceived as the most important (i.e. environmental, subsistence and economic forest values). These values provide, among others, wide variety of foods, such as wild crops and bushmeat, farming land, medicinal plants, household items such as ropes, lianas and mats, firewood and shelter. Aesthetic and religion-related forest values are considered to be the least important. Multivariate binary logistic regression analysis suggests that farmers' forest values may to some extent influence their compliance with the tree-felling rule. Economic, religion-related and learning forest values are likely to encourage compliance with the tree-felling rule.

Introduction

Incorporation of multiple forest values and multiple stakeholders in governance of forest resources are among the most prominent principles of sustainable forest

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management. Recognition of multiple forest values has attracted significant attention in the social and economic sciences. Conventionally, however, forest values have been largely perceived in monetary terms and assessed using market-based valuation techniques (Costanza et al. 1997). Despite the importance of market-based valuation techniques, their limitation in measuring social and cultural dimensions of forest values are largely acknowledged (Kant and Lee 2004). This study goes beyond the economic and monetary scope of value, emphasising the social, cultural and ethical context of forest values (Rolston and Coufal 1991; Bengston 1994; Manning et al. 1999; Saastamoinen 2005). The study assesses the variety of forest values—from economic to spiritual and intrinsic—in terms of their relative importance for farmers in the fringes of forest reserves in the High Forest Zone of Ghana.

As the gap between objectives and actual impacts of forest policies and the legal framework widens, one of the emerging strategies to address that gap is enforcement of forest legislation. The EU Forest Law Enforcement Governance and Trade (FLEGT) initiative is an example, which aims to address the lack of forest law compliance and policy implementation by strengthening forest law enforcement (EC 2003; GoG/EU 2009). Specifically, it aims to address the trade of legal timber, by strengthening the law enforcement and forest governance sectors in timber-producing countries (EC 2003; Brown et al. 2008). Ghana was the first country to start the implementation of the EU FLEGT, by signing the Voluntary Partnership Agreement (VPA) with the EU, in September 2009 (GoG/EU 2009). One of the major challenges concerning the implementation of the EU FLEGT in Ghana is the lack of compliance with the existing forestry legislation (Beeko 2009; Hansen 2011). In this context, much research has focused on the extent and consequences of illegal logging worldwide (Kaimowitz 2003; SCA&WRI 2004; Tacconi 2007a) and the monetary incentives and power relations in terms of compliance (Marfo et al. 2009; Hansen 2011). Currently, however, considerably less research, has dealt with factors that determine individual compliance behaviour (Tacconi 2007b; Hansen 2011); let alone the potential associations between forest values and compliance with forest laws.

The primary objective of this paper is to assess farmers' values towards the forest (i.e. what farmers value about the forest), and the context of these values (i.e. the reasons for which they consider certain forest values as important, and others as unimportant). In addition, an attempt is made to statistically test the potential associations between farmers' forest values and their compliance with the forestry rule that regulates tree-felling (tree-felling rule) in Ghana.

Theoretical Framework

Forest Values: Concept and Relevance in Forest Management and Decision-Making

In sociology, values are regarded as social phenomena and factors explaining human action (Karppinen 2000). Rokeach (1973) defines a value as: 'an enduring belief

that a specific mode of conduct is personally and socially preferable to an opposite mode of conduct or an end-state'. This definition highlights some of the main features of value: *belief, preference* and *end-state*. Further, the aspect of *personal and social preference* indicates that values are widely shared by all members of a group (e.g. culture, nation). Rokeach's value theory was more recently updated and developed, in what is known as, 'universal theory of content and structure of value" (Schwartz 1992). Schwartz's theory distinguishes between different value types, which are further organised in value structures, in accordance to conflicts and compatibilities existing between different value types.

Drawing on Rokeach's work, Bengston (1994) and Bengston and Xu (1995) define forest value as a 'relatively enduring concept of the good related to the forest and forest ecosystems, in a specific cultural and societal context'.

In general, a distinction can be made between two types of values—basic or fundamental values, and object or assigned values (i.e. values assigned to a specific object). The former type of value is more common in the field of psychology (Rokeach 1973), while the latter is found in the field of economics (Bengston 1994). Basic or fundamental values are stable, fewer in number, transcend specific objects and situations and are largely shared by the society (Rokeach 1973; Schwartz 1992; Vaske and Donnelly 1999); while assigned or object values are more specific and depend on specific contexts and situations. However, the two are related in the so-called' relational realm of value' (Brown 1984), meaning that people apply their basic values to the task of valuing objects. Both basic and assigned values are important, and both influence individual and public perceptions and responses to forest management and policies (Bengston 1994). In this study, the focus is on the values assigned to the forest (the forest values) and their influence on law compliance behaviour.

In his seminal work Kluckhohn (1957) defines value orientation as "a set of linked propositions embracing both values and existential elements". In the more recent literature on environmental and forest values, value orientation is defined as "a cluster of interrelated values and basic attitudes and beliefs about the environment/ forest" (Vaske et al. 2001; Bengston et al. 2004). However, while values appear long-living, empirical research suggests a shift in the value orientation towards nature and the forest. For instance, in the United States and Australia a shift of public forest value orientation from anthropocentric and commodity based to biocentric (environmental), as well as an increased preference for moral, spiritual and aesthetic values (Bengston and Xu 1995; Bengston et al. 2004; Webb et al. 2008) has been noted. In contrast, a weakening of traditional, spiritual, and religion based value orientations towards the forest and nature in general, is observed in Ghana (Boaten 1998; Falconer 1992; Sarfo-Mensah et al. 2010).

Cognitive Hierarchy Framework as a Basis for Understanding the Role of Values on Behaviour in Forestry

The cognitive hierarchy model (Vaske and Donnelly 1999) and the value-belief-norm theory (Stern et al. 1995; Stern 2000) suggest that basic values provide a foundation for higher orders of cognition, such as beliefs, attitudes and behaviour. More precisely they propose a link between values on one side and behaviour on the

Table 1 Forest values: typology and defining statements as used in the interviews

Use-forest values	Non-use forest values
Economic Because of the opportunity to use the forest for timber, cash crops, earnings from selling forest products	*Cultural* Because forest forms a part of Ghana's national heritage, our old customs and traditions
Subsistence Because of the opportunity to use it for food (crops, vegetables, meat, fruits, etc.), shelter, household items, firewood	*Moral* Because I feel it is my moral duty and responsibility to protect the forest, so that others as well can enjoy it
Environmental Because it provides clean and healthy air, water, soil, rainfall, shade, living space for animals	*Future* For the future generations—my children and the children of their children—to experience the forest as it is now
Aesthetic Because of the opportunity to be in forest and enjoy its beauty, natural surroundings, the scenery, sites, wilderness	*Intrinsic* Because I value the forest in itself, merely for its existence; even if I wouldn't acquire any benefit from it, I would equally value it
Medicinal Because of the opportunity to use medicinal plants and improve my health and wellbeing	*Religion-related* Because it is a place to worship God and the nature. It has a religious meaning to me—it is a sacred and holy place
Learning Because of the opportunity to learn about growing and tending trees and plantations	*Spiritual* Because it offers inner peace through contact with nature

other; a link that has also been supported by empirical research (McFarlane and Boxall 1999; Vaske and Donnelly 1999).

Attitude is defined as a "relatively enduring organization of belief around an object or situation predisposing one to respond in some preferential manner" (Rokeach 1972). Therefore, unlike values, attitudes are more specific, bound to situations, objects and issues, they are more in number, and are more likely to change over time (McFarlane and Boxall 1999, Vaske and Donnelly 1999). The value-belief-norm theory in particular deals with the concept of object value and its role in influencing behaviour towards environmental issues (Stern 2000). For instance it is suggested that people who value a specific object (e.g. old-growth forest) develop beliefs about adverse consequences for that object, which further translate into their attitudes and behaviours towards the object in question (e.g. actions and activism to save old-growth forest; Stern et al. 1995). Empirical research has looked at the role of forest values on attitudes and behaviour towards forest management practices and decision-making (Rolston and Coufal 1991; Keeney 1996; Karppinen 1998; Manning et al. 1999; Brown and Reed 2000; Ford et al. 2009). These studies in general suggest that values and attitudes towards forests can to some extent influence behaviour. However, correlations between specific forest values (e.g. economic) and behaviour (e.g. harvesting behaviour) are not straightforward and should not be assumed. For instance, Brown and Reed (2000) and Manning et al. (1999) find that the economic value is associated with commercial logging and materially oriented forest management; while values such as ecological, aesthetic, moral/ethical, scientific and spiritual forest values are associated with non-materially oriented forest management and wilderness. Karppinen (1998) on the other hand, finds that the sole emphasis on economic values does not lead to an active harvesting behaviour.

The above theoretical framework and empirical evidence proposes relationships between values and behaviour towards the forest. However, to be able to utilise forest values as a tool in our analysis, it is first necessary to develop a classification of forest values and to assess their relative importance for the research population—farmers. Likewise, to understand the potential role of values on law compliance behaviour, the law compliance theory is reviewed. Concerning the former, a classification of 12 forest values, which were further grouped in use and non-use forest values was adopted (Table 1). The forest values, their classification, and defining statements are based on literature (Rolston and Coufal 1991; Bengston and Xu 1995; Manning et al. 1999; Moyer et al. 2008) and the preliminary interviews and pre-tests.[1]

Law Compliance Theory

Young (1979:4) defines law compliance as, "… all behaviour by subjects or actors that conforms to the requirements of behavioural prescriptions or compliance systems. Conversely, non-compliance is behaviour that fails" (to conform to the requirements). The compliance theory deals with a fundamental question: why do people obey the law? There are two perspectives to this question: instrumental and normative (Tyler 1990; Honneland 1999). According to the instrumental perspective, people obey laws because of the expected costs and benefits of compliant versus non-compliant behaviour (e.g. expected illegal gain vs. expected fear of sanction). This perspective is based on the rational choice theory and emphasises the role of deterrence and coercive measures on compliance (Becker 1968). The normative perspective, on the other hand, maintains that people obey laws based on normative reasons, such as values, principles and norms. These norms, principles and values make people perceive the laws as fair and legitimate, which in turn leads to an internal moral obligation to obey the laws (Tyler 1990, Tyler and Jost 2007). The normative perspective specifically emphasises the role of norms or morals, and legitimacy in determining compliance. Norms/morals can be defined as commonly accepted rules that prescribe desirable behaviour, and forbid behaviour that has been deemed undesirable (Cialdini and Trost 1998; Hatcher and Pascoe 2006). Legitimacy, on the other hand, is about the support given to political authority or authorities to direct behaviour, to enact and implement laws, decisions and regulations. It is proposed that the legitimacy of an authority is judged based on persons' normative, not instrumental reasons (Tyler 1990).

The specific role of values in compliance behaviour can be described using the normative perspective of compliance—more specifically the context of social and personal norms. Social norms are principles or values that are understood, accepted and shared by members of a group, and that guide and/or constrain behaviour in a social space (Cialdini and Trost 1998). Personal norms, on the other hand, are seen as internalised social norms, which influence an individual's behaviour irrespective

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[1] It should be noted that the aesthetic and learning forest values, unlike in the literature, were classified as use forest values. This was done following the preliminary interviews and pre-tests, where respondents explained these values in the context of their utility.

of actions and expectations of others (Posner 1997; Hatcher and Pascoe 2006). In summary, compliance behaviour is determined by the following factors of compliance: (1) instrumental factors, such as costs and benefits, sanctions and inducements (rewards for compliance); (2) norms or morals, e.g. personal values, tradition, culture, group behaviour; and (3) legitimacy, e.g. general satisfaction with authorities and their decisions, participation in the decision making process (Tyler 1990; Honneland 1999; Nielsen 2003). In addition to these theory-based factors of compliance, the empirical research on non-compliance in forestry emphasises the role of contextual or external factors on compliance (e.g. market and trade, regulatory and legal constraints, ownership rights and corruption; Contreras-Hermosilla and Peter 2005; Tacconi 2007b; Blasser 2010).

Based on the value-belief-norm theory and the theory of law compliance, the assumption in this paper is that farmers' values towards the forest will influence their personal beliefs and norms, which in turn, will inform their compliance with the studied rule that regulates felling of trees.

Context: Farmers' Rights to Trees in Ghana

As noted above, the question of law compliance is complex in itself; but it is especially so in cases where there is a parallel existence of statutory and traditional rules and institutions that regulate forest ownership, management, and use rights, as it is in Ghana (Amanor 1999; Larbi 2006). The plurality of forest governance institutions in the country originates from the colonial time. Prior to colonial rule, forests were owned in common by the communities (Amanor 1999). Colonial rule established new institutions for ownership and management of land and forest, by transferring the power and the ownership from the communities to appointed chiefs (traditional authorities), who became custodians of the tradition (Amanor 1999:43). Forest reserves, as protected areas, were established under the colonial rule, from the end of the 1920s until the end of 1940s (Kotey et al. 1998). Apart from the forest in the forest reserves (on-reserves), considerable forest and timber resources are found outside the reserves (off-reserves; Boateng et al. 2009). The off-reserves comprise a mixture of agricultural lands (farmlands) with naturally occurring timber trees and patches of natural forest (Amanor 1996; Boateng et al. 2009), where farming forest communities have settled. This area is important for commercial timber production, but also for the livelihoods of the communities (Boateng et al. 2009).

Since the introduction of 1962 Concessions Act (GoG 1962), management, harvesting and ownership rights of all naturally occurring timber trees[2] are vested in the state; including trees in the forest reserves and outside them, on private land and communal land, including the individual farmlands (Amanor 1999; Acheampong and Marfo 2009; Boateng et al. 2009). Accordingly, it is an offence for any individual, or community—to fell trees without an official permit from the authorities. However, such a permit may be applied for, and obtained only by registered timber firms, or for community development projects, but, not by an individual farmer for domestic or commercial purposes. This rule effectively denies

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[2] 'Naturally occurring trees' virtually means all trees except those planted in plantations.

farmers' rights to benefit from timber trees on their farms (Amanor 1999). The controversy associated with the forest legal framework is that farmers nurture and manage the off-reserve timber resources, as a part of their farming practices. However, when the trees are mature, they are treated as naturally occurring, and thus the farmer does not have the legal right to harvest, manage or protect the trees. The trees, including those on private farmlands, are given under concessions to governmental and private companies. The tree felling rule in this study refers to the rule that, based on forest legislation (GoG 1962), does not permit farmers to fell timber trees for domestic or commercial purposes.

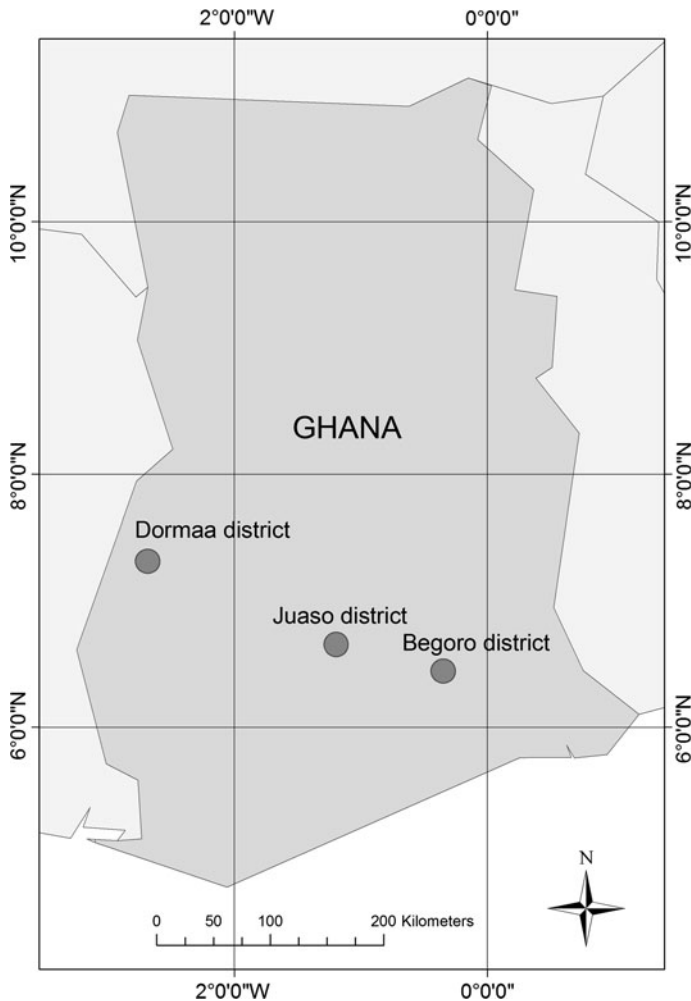## Materials and Methods

Study Area

Ghana covers a total area of 23.5 million hectares, with an estimated population of 25.2 million people in 2012 (CIA 2011). The study area is located in the High Forest Zone (HFZ) of Ghana, which constitutes the southern, most forested one-third of the country. It covers a total land area of 8.5 million ha, 1.6 million ha of which is designated as forest reserves (Affum-Baffoe 2002). The study is conducted in three forest districts: Dormaa, Begoro and Juaso, belonging to the following administrative regions, respectively: Brong Ahafo, Ashanti and Eastern Region (Fig. 1). The forest districts are in different ecological zones: Dormaa is in the dry semi-deciduous zone, Juaso is in the semi-deciduous zone, and Begoro in the moist-semi-deciduous zone.

The forests in the study area are considered tropical forest (Wagner and Cobbinah 1993), with generally high species diversity, multiple canopy layers, and slow growth rates for mature forest.

In the fringes of these forest reserves (off-reserves) many farming communities have found their shelter and established their living—the so-called forest fringe communities, which are typically farming communities (Blay et al. 2008; Boateng et al. 2009). The study was conducted in 10 forest farming communities, scattered around the following forest reserves: Pamu-Berekum and Mpamasu in the Dormaa forest district; South and North Fomanso, Domeriver and Preku in the Juaso forest district; and Southern Scarp and Worobong South in the Begoro forest districts. Despite the above mentioned ecological differences, the economic, socio-political and cultural conditions in the ten forest farming communities are similar. The communities face a rapid change of values—from traditional to modern (Sarfo-Mensah et al. 2010), unclear forest and tree tenure and changes in forest policy and legislation (Acheampong and Marfo 2009). Furthermore, the forests in the area are subject to heavy timber exploitation, raising concerns for deforestation and illegal logging (Marfo et al. 2009).

Sampling and Data Collection

Farming communities were randomly selected from the register of farming communities located nearby forest reserves. Before the fieldwork commenced, in

Fig. 1 Map of Ghana showing the study areas in the three forest districts

each community the village chief, committee chairman or an elder was approached, asked for fieldwork permission, and interviewed. In addition, six pre-test interviews in three communities were conducted. It should be noted that, according to the information obtained from the forest district offices, these communities were predominantly farming communities, where every household was involved in some kind of farming activity. For each community the total number of households and its approximate boundaries and shape were known. However, as there were no additional information available, it was not possible to conduct random sampling. Instead we aimed to interview approximately 10 % of the households in total. An in situ interview plan was made, where approximate shape and boundaries of the community, as well as the locations of households for interviews were defined. The interview plan aimed at covering different parts and units of the community.

The interview plan was followed as closely as possible; households which most closely coincided with the specified locations were approached and their heads were subsequently interviewed.

Respondents were heads of farming households and therefore farmers by occupation. Household is defined as a basic farming unit, comprising of members who directly contribute and/or are directly dependent on the home economy. The head of a household is the bread-winner in the family, with farming as the main occupation. In each household one respondent was interviewed. In total 226 interviews with heads of 226 farming households were conducted. The highest number of interviews per community was 32, and the lowest was 16. The sample covers 9.3 % of the base population (household heads) in the 10 selected communities.

Data were collected through semi-structured face-to-face interviews, conducted by a fieldwork team from the Forest Research Institute of Ghana (FORIG). Most of the interviews were conducted in the local dialect Twi, with narratives recorded in English. The fieldwork was conducted from April to July 2010. Each interview took approximately 1–1.5 h to complete.

Data on forest values were collected in two subsequent exercises: (1) identification of all forest values (value identification exercise), and (2) ranking of importance of twelve predefined categories of forest values (value ranking exercise). The methodology for collecting data on forest values is adopted from Kant et al. (2003) and Kant and Lee (2004), although some modifications were needed. In the value identification exercise, the respondents were asked to name all that they value about the forest. In the value ranking exercise the respondents were presented with twelve predefined forest values (Table 1), and were asked to rank them with respect to their relative importance. Finally, using an open-ended question, the respondents were asked to give reasons for ranking a certain forest value as the most important, and another as the least important. Respondents could give more than one reason, allowing for multiple responses.

The question used to assess farmers' law compliance with the tree-felling rule was: *"Would you fell timber tree/trees without permit?"* The answer options were: *yes* (indicating non-compliance), *only in difficult situations* (indicating low compliance and tendency for non-compliance), and *no* (indicating high compliance). To promote accurate reporting respondents were informed of the topic and aim of the research in advance, and could choose to participate in the survey. They were assured that the research team has no relation to the forestry department. Further, no personal information, such as personal and family names were collected. None of approached interviewees declined to participate in the survey, which brings the response rate up to 100 %.

Data Analysis

The value identification exercise, where the respondents identified all they value about the forest, resulted in over 100 forest value items. These forest value items were organised in 32 broader categories of forest values (Appendix). Identified forest value categories were coded and entered in the SPSS software (Statistical

Package for Social Sciences). To identify the main or most dominant forest values, the percentage of respondents who identified the forest values was considered.

Concerning the ranking of importance of predefined use and non-use forest values, non-parametric tests were applied, following Kant et al. (2003) and Kant and Lee (2004). First, *Friedman's two-way* analysis tested the variance of ranks of importance, in order to determine whether different categories of forest values, within the group of use and non-use values, were assigned different ranks of importance. As the *Friedman's test* indicated statistically significant differences in the importance of forest values, pairwise multiple comparisons of subsets of values, with Bonferroni adjusted p-values were conducted. The objective of these comparisons was to determine the final order of importance for each forest value. The pairwise comparisons were done separately for forest values within the two groups (use and non-use forest values), as the ranking of importance for these two groups in the survey was also done separately. Finally, to understand why the respondents perceive certain forest values as the most, and others as the least important, the percentage of specific responses was calculated.

To test the statistical associations between the forest values (explanatory variables) and compliance with the tree-felling rule (dependent variable), multivariate binary logistic regression analysis was applied (Hosmer and Lemeshow 2000). In order to assure a sufficient number of observations in this multivariate analysis, the ranks of importance of predefined forest values were aggregated from the original six categories of importance (1—most important, to 6—least important) to three categories of importance: 1—important (corresponds with categories 1 and 2 in the initial categorisation), 2—somewhat important (corresponds with categories 3 and 4), and 3—least important (corresponds with categories 5 and 6). Likewise, the dependent variable—compliance with the tree-felling rule was aggregated from the original three categories of compliance (1—high compliance, 2—low compliance, and 3 non compliance) to two categories: 1—high compliance, and 2—non compliance (corresponds with original categories 2 and 3). The latter aggregation was based on the assumption that the respondents tend to underreport self non-compliant behaviour. Alternative models with different potential explanatory variables were compared and evaluated using information-theoretic model selection (Burnham and Anderson 2002). The final model selection was based on the Akaike information criterion (AIC), which penalizes the addition of parameters, and thus selects a model that fits well, but has a minimum number of parameters. The smaller the AIC value, the simpler and better is the model.

Results

Socio-Economic Characteristics

Of the 266 respondents 97 % were farmers, while the rest reported chainsaw operations (1 %), carpentry (1 %) and hunting (1 %) as their main occupation. The gender pattern was as follow: 70 % were male and 30 % female. Concerning the age distribution, 15 % of the respondents were from 18 to 30 years old, 74 % were

between 30 and 60 years old, and 11 % were above 60 years old. The majority (74 %) had attended primary, junior or middle school, 6 % had senior or higher education, while 20 % had no formal education. Concerning the origin, 64 % were indigenous to community, while the remaining respondents were migrants from other parts of the country. Most of the respondents had their own farming land (75 %), while the rest were renting land or sharecropping. The average household size was around 7 members and the average monthly income from all household activities was estimated to amount to 145 Ghanaian Cedi (approx. USD 100); 70 % of respondents had an income under the average.

Forest Values and Their Importance for Farmers

Most of the forest values identified by the respondents are use-forest values (29 out of 32), and fall into one of the following categories: subsistence, environmental, economic and learning forest values. The non-use forest values are less diverse and include the following categories: future, cultural and spiritual forest values (Appendix). Aesthetic and religion-related forest values were not identified by farmers; nevertheless, they were included in the adopted classification of pre-defined forest values.
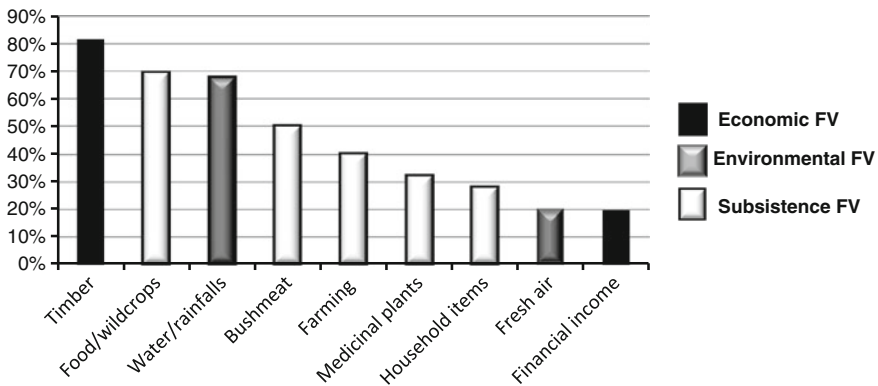
The four most dominant forest values—acknowledged by at least 50 % of the respondents include: timber; food and wild crops; water and rainfall; and bushmeat. Next are farming, medicinal plants, and household items (e.g. mats, ropes, different cooking utensils), identified by 30–40 % of the respondents (Fig. 2). The subsistence forest value is the most diversified, followed by environmental and economic values.

The rankings of importance of different categories of forest values are statistically different (Friedman test statistic = 575.2, $p = 0.000$, $df = 5$, n = 225 for use forest values; Friedman test statistic = 357.5, $p = 0.000$, $df = 5$, n = 226 for non-use forest values). The pairwise multiple comparisons provided the final order of importance of all categories of forest values (Table 2). In Table 2 some values have the same order of importance (e.g. environmental, economic, and subsistence forest values are all marked with 1—most important). This means that in pairwise comparisons there was no statistically significant difference in the ranking of these particular subsets of forest values. The same holds for moral and cultural, and intrinsic and spiritual forest values.

The results from the identification and ranking of importance exercises are consistent, and suggest the following: (1) environmental, subsistence and economic forest values are the most important in the group of use-forest values; (2) the future forest value is the most important in the group of non-use values; and (3) aesthetic and religion-based forest values are the least important in their respective groups.

The Context of Forest Values: Why Farmers Ascribe Importance to Forest Values?

Table 3 presents the reasons why respondents ascribe high importance to some forest values (upper half of the table) and low importance to others (lower half of the table).

Fig. 2 List of dominant forest values identified by farmers. Percentage of respondents (N = 226)

Table 2 Pairwise multiple comparisons of subsets of values: order of importance of use and non-use forest values (1—most important to 6—least important)

	Environmental	Subsistence	Economic	Medicinal	Learning	Aesthetic
Use-forest values[a]						
Order of importance	1	1	1	2	3	4
	Future	Moral	Cultural	Intrinsic	Spiritual	Religion
Non-use forest values[a]						
Order of importance	1	2	2	3	3	4

[a] It should be noted that the ranking of forest values is done separately for use and non-use forest values. Therefore, the importance of forest values across these two groups cannot be compared

The major reasons for perceiving the most important forest values as such are related to the contribution of these values to subsistence and livelihood support. In the case of the environmental forest value, the share of subsistence and livelihood related reasons (e.g. rainfalls for farming, animals as a source of food, soil fertility, food security) is 77 % from the total reasons given. For the economic forest value, this share is 40 % and includes reasons such as: subsistence, timber for shelter, support for family and community members in need, medicinal plants. In the case of subsistence and future forest values, the share of subsistence related reasons from the total reasons given is 90 and 44 %, respectively and includes: food provision, animals as source of food, health, rainfalls for farming and soil fertility, farming land, shelter and medicine for present and future generations.

Along with the reasons related to subsistence and livelihoods, the respondents noted other reasons for which they perceive the most important forest values as such (Table 3), including: environmental protection (e.g. clean air, habitats for wild animals, climate regulation and shade), economic benefits (e.g. income, employment, governmental revenues), knowledge (opportunity for future generations to know and experience the forest as it is today) and moral responsibilities (feeling of

Table 3 Reasons for which respondents perceive certain predefined forest values as the most important/the least important. Number and percentage of responses

Most important forest values	Environmental services	Economic benefits	Subsistence and livelihoods	Knowing/ experiencing forest	Moral responsibility
Main reasons for perceiving forest values as the most important					
Environmental	32 (23 %)		109 (77 %)		
Economic		65 (60 %)	43 (40 %)		
Subsistence		8 (10 %)	78 (90 %)		
Future	1 (1 %)	6 (3 %)	75 (44 %)	64 (37 %)	25 (15 %)
Least important forest values	No benefits	Recent decline of importance	Uncommon practice	Prohibited to worship in forest	Relevant in the future/forest now destroyed
Main reasons for perceiving forest values as the least important					
Aesthetic	18 (22 %)		65 (67 %)		9 (11 %)
Religion-based		70 (72 %)	18 (19 %)	9 (9 %)	

guilt for destroying the trees, moral responsibility to leave the forest in the condition they have found it).

Aesthetic and religion-related forest values are considered as the least important. The main reasons for the perceived low importance of the aesthetic value appear to be related to an understanding that it is not common to appreciate the forest beauty in Ghana (67 % of the given reasons), that forest beauty provides no benefits or livelihood (22 % of the given reasons) and a perception that at present the aesthetic forest value is irrelevant in Ghana, but it may become so in the future (11 %). In the case of religion related forest values, the main reason (72 % of the total reasons given) was related to the recent decline of importance of this value (e.g. "it is not a place to worship God in the forest anymore", "…only chiefs nowadays respect this tradition"). It should be further noted that 9 % of the total reasons given for the low importance of religion-related forest value were associated with discouragement to worship in the forest (e.g. "it is prohibited by authorities to worship in the forest", "no forestland is allocated for religious/spiritual use").

Compliance with Forestry Rule and Associations Between Forest Values and Compliance Behaviour

Concerning compliance with the tree-felling rule, in total 68 % of the respondents reported that they would violate the rule; 45 % of which said they would do so in any case and 23 % said they would do so only in a difficult situation (e.g. cannot afford to buy lumber, need resources for domestic use and subsistence). Thirty-two percent reported that they would comply with the rule.

Concerning associations between the forest values and compliance, the model selection based on the Akaike Information Criterion (AIC) resulted in only three

Table 4 Alternative model specifications. For each model presented is the log likelihood (LL), number of parameters (p) and Akaike Information Criterion (AIC)

Model no.	Explanatory variables (c = constant)	LL	p	AIC
1	c, economic, learning, religion, environment, cultural, moral, future	−116.8	15	263.6
2	c, economic, learning, religion, cultural, moral, future	−117.1	13	260.2
3	c, economic, learning, religion, cultural, future	−117.5	11	257.1
4	c, economic, medicinal, learning, religion, cultural, intrinsic	−116.5	13	259.0
5	c, economic, medicinal, learning, religion, intrinsic	−117.4	11	256.7
6	c, economic, learning, religion, intrinsic	−117.9	9	253.8
7	**c, economic, learning, religion**	**−119.7**	**7**	**253.5**
8	c, learning, religion	−125.9	5	261.8

The final model in bold

forest values being included in the final multivariate regression model: economic, religion-related, and learning forest values (Table 4). The estimated coefficients (B) and the significances (Sig.) were used to interpret the existing associations between the importance of different forest values and the degree of compliance with the tree-felling rule (Table 5). To evaluate the suitability of the model, the Hosmer and Lemeshow's goodness of fit, the ROC-curve and the Nagelkerke's R^2 were calculated (Table 5). The Nagelkerke's R^2 indicated that the proportion of variance explained by the model is 23 %, indicating that there are factors not accounted for in this model that account for compliance behaviour. Nevertheless, high goodness of fit (0.796) and area under ROC-curve (0.734) indicate a high predictive ability of the model (Hosmer and Lemeshow 2000).

Table 5 Results of multivariate binary logistic regression for compliance behaviour (dependent variable is 1 in case of non-compliance; and it is 0 in case of compliance)

Explanatory variables	Class	B	Sig. (p value)
1. Religion related FV	High importance	−1.299	0.003
	Middle importance	−0.907	0.017
	No importance (reference)		
2. Economic FV	High importance	−1.906	0.007
	Middle importance	−1.503	0.044
	No importance (reference)		
3. Learning FV	High importance	−0.606	0.379
	Middle importance	−1.751	0.000
	No importance (reference)		
4. Constant		3.258	0.000

Nagelkerke R^2: 0.231

Hosmer and Lemeshow test (goodness of fit p value): 0.796

The area under the ROC-value: 0.734

Respondents who ascribe high importance to economic and religion-related forest values are more likely to comply with the tree-felling rule, compared to those who ascribe middle or least importance to these values. Similarly, respondents who ascribe middle importance to the learning forest value are more likely to comply compared with those who ascribe high or no importance to this specific value. No association was found between compliance and some important forest values, such as subsistence, environmental and future forest values.

Discussion

Forest Values and Farmers' Livelihoods and Subsistence

With the exception of the future forest value, the use-forest values are more appreciated—perceived as more important in comparison to non-use forest values. The utility and financial implications of the use-forest values (i.e. environmental, subsistence and economic) are not doubted. The interpretation of the results may therefore suggest that farmers are primarily interested in using forests for commercial use, to improve their economic well-being and self benefits. However, farmers tended to place these values in the context of subsistence and livelihoods (e.g. timber for shelter, rainfalls for farming and food, biodiversity as source of food), rather than in the context of commercial use and purely economic benefits (e.g. timber for commercial use, direct income), or for the provision of environmental services (e.g. climate regulation and biodiversity).

The high relevance given to subsistence and livelihood support implies that farmers are highly dependent on forests for their basic needs. Scott (1976) and Thompson (1971) in their moral economy model propose that motivations and objectives of rural populations, using forests and other natural resources, are embedded in their moral right to subsistence and in a web of social relations (i.e. social obligation to maintain these relations and support other family/community members in need). The right to subsistence, support for family and moral obligations to help others are strongly emphasised by farmers. The social relations and obligations of those who are better off to those in need, are manifested as help in goods (food, clothes, share of resources such as land, or harvest) or financial support. The latter is especially common among the migrants from the Northern part of the country (35 % of respondents), who are expected to provide for their relatives back home, where the one harvest a year rarely satisfies the all-year-round need for food. While these reasons are of a material nature, the objectives and interests of farmers are not, as their objectives are not profit-making, rather life subsistence for themselves and their families—an objective they have a moral right to (Scott 1976). These and related hardships, livelihoods and subsistence needs also appear to guide forest farmers' motivations and actions with regards to forests, elsewhere in the forest zones of Africa (Blay et al. 2008; Appiah and Pappinen 2010; Russell et al. 2011).

The reported low importance of religion and spiritual forest values was not unexpected; the religion-related forest value was not identified by the farmers in the

first place (Appendix). This confirms the results from earlier studies, suggesting a decline in traditional and religion-based values among forest communities in Ghana (Ntiamoa-Baidu 1991; Falconer 1992; Boaten 1998; Sarfo-Mensah and Oduro 2007; Sarfo-Mensah et al. 2010). This literature suggests that spiritual and religious bonds of people to forests were the central element of the traditional religion and value system. The Earth was believed to have spiritual powers and was seen as the home of the gods, ancestral spirits and other supernatural beings and powers. Nature was guarded in the trust of ancestors for present and future generations, which in turn induced fear and respect for nature. It is worth mentioning certain historical and recent drivers of change, which are likely to promote a decline in traditional forest values in Ghana. Prominent historical drivers include colonisation, introduction of foreign culture, education and religion (Boaten 1998; Kasongo 2010). Recent drivers of change, on the other hand, include the change of life style, population pressure and conflicts over natural resources (Ntiamoa-Baidu 1991; Sarfo-Mensah et al. 2010). All of these are likely to contribute to an increased dependence on forests, and decreased belief in the sacredness of nature and forests in Ghana.

In the above context, alternative livelihood strategies for farming communities need to be developed; strategies that would decrease farmers' dependence on forests and at the same time lessen the pressure on forest resources. Most importantly, such strategies and solutions should emerge at local level, empower local populations and fit the local conditions, needs and capacities; if the common problems of "outsider shaped strategies" are to be avoided (Ostrom 1990; Russell et al. 2011).

Values and Compliance Behaviour

As the results suggest certain linkages between farmers' forest values and their forest law compliance behaviour, it follows that they generally support the study assumption, and are consistent with the cognitive hierarchy model. The latter is consistent with the previous studies that use this model to predict environmentally significant behaviour (Vaske and Donnelly 1999; Stern 2000). However, the specific finding that the economic forest value is positively associated with compliance (i.e. those who consider economic forest values as most important are more likely to comply with the tree-felling rule), does not support the conventional thinking, which would suggest an opposite trend. The positive association between economic values and compliance is likely connected to farmers' tendency to equate the economic forest value with subsistence and livelihood support; and in this context, to their concerns about forest degradation and adverse impacts on their livelihoods. Farmers are well-aware of the problems of deforestation, expressing concerns about declines in harvests, rainfalls and soil fertility. Furthermore, following the instrumental perspective of law compliance (Becker 1968), it can be assumed that those respondents will comply in order to avoid financial penalties and sanctions associated with non-compliance.

Results suggest that the religion and learning forest values affect compliance in a positive way, i.e. those who rank the values as important are more likely to comply with the tree-felling rule. The positive associations between the values and compliance are consistent with the normative perspective of law compliance theory. Keeping further in mind that both of these values, and especially the religion-related forest value, were ranked as the least important (Table 2) and the level of non-compliance is relatively high, the results suggest that the weakening of the traditional close-to-nature religions may have contributed to forest exploitation and an increased resistance to formal forestry rules in Ghana. This is a noteworthy finding and proposition, although it should be noted that the number of cases where the religion-related forest value was ranked as the most important was small.

The study results imply that there are reasons to believe that values towards the forest can influence forest law compliance behaviour among forest farmers. However, it should be acknowledged that the statistical associations between forest values and compliance behaviour are rather modest and vague. No associations between compliance and some important forest values, such as subsistence, environmental and future forest values, were found. The lack of associations confirms the complexity of the law compliance behaviour and the role of other compliance relevant factors, e.g. the fear of sanction, legitimacy of authorities, perceived fairness of rules (Becker 1968; Tyler 1990; Nielsen 2003), or context specific factors such as corruption, ownership, regulatory and legal constraints (Contreras-Hermosilla and Peter 2005; Blasser 2010). Such factors are likely to hinder the assumed direct influence of farmers' values on their compliance. In other words, even though an individual farmer may cherish certain values, e.g. moral and future forest values, and accordingly may believe that forests should be protected for future generations; the specific conditions (e.g. the lack of alternative livelihood options, or the perception that the rule is unfair) may prevail and lead to non-compliance.

Reflections, Further Research and Policy Implications

While the study sheds light on the importance of forest values for farmers and possible associations between forest values and forest law compliance, some limitations should be acknowledged. The main limitation regarding data collection was a restricted access to data for the base population (household heads). Due to this limitation, it was not possible to perform simple random sampling or stratified sampling techniques; which are considered to involve a relatively low selection bias (Seale 2012). Although the potential bias in the responses cannot be assessed, the large number sampled—including about 10 % of the base population—greatly reduces the risk of bias and the risk of non-representativeness of the sample. Regarding the potential associations between values and compliance, it should be noted that the model does not include all theoretically important variables, as suggested by the law compliance theory. As the study focuses on the associations between values and law compliance

behaviour, the forest values were taken as the only explanatory variables of compliance. Future studies will benefit from expanding the range of variables with potential influence on law compliance behaviour. An advanced and expansive analytical framework for the study of forest law compliance is called for. This framework should consider the compliance factors emphasised in behavioural, cognitive, institutional and law compliance theories (North 1990; Ostrom 1990; Tyler 1990; Cialdini and Trost 1998; Nielsen 2003); but also the contextual factors—emphasised in the empirical research of compliance in forestry (Contreras-Hermosilla and Peter 2005; Blasser 2010).

Finally, outlined are some implications for forest policy and legislation in Ghana. Ghana aims to strengthen compliance with existing forestry laws, by adhering to the FLEGT Voluntary Partnership Agreement (VPA) with the EU. The VPA can be seen as an improvement in comparison to market-driven instruments (e.g. forest certification), as it includes other measures, such as legality assurance system (prescribed standards of legality) and forest law enforcement (GoG/EU 2009). However, it has been argued that the VPA's approach to legality and compliance in Ghana is too narrow, suggesting the enforcement of existing forest laws as the only strategy to induce forest law compliance (Hansen 2011). Understanding the reasons for non-compliance with existing forest legislation, prior to enforcement of that legislation, is critical. A particular effort should be made to minimise legal inconsistencies with regards to tree tenure and usufruct rights. Successful and effective implementation of forest law enforcement initiatives, such as FLEGT VPA in Ghana, to a large extent will depend on the level to which they effectively address and consider the local values and domestic forestry issues, including farmers' rights and access to forests. Concerning the forest farming communities, their dependence on forests for subsistence and livelihoods in particular needs to be taken into consideration, and efforts should be made to establish a legal framework that will safeguard their livelihood. As this study has confirmed, farmers' values towards forests may influence their compliance with forest legislation. Therefore, efforts to strengthen compliance with forest legislation may benefit from inclusion and consideration of stakeholders' values, in general. Systematic ways and tools to facilitate the inclusion of such information in policy and law decision-making processes need to be further developed.

Appendix

See Table 6.

Table 6 Forest values identified by respondents. Percentage of respondents who identified these forest values (N = 226)

Use-forest values				Non-use forest values
Subsistence	Economic	Environmental	Educational and learning	
1. Various food items and wild crops (69.5 %)	Timber (81.4 %)	Water (rainfall for farming, availability of fresh water) (67.7 %)	Learning and research purposes (0.4 %)	*Future forest values* and responsibility to future generations (8.8 %)
2. Bushmeat and game (50.0 %)	Financial income from selling food, timber, NWFP (19.5 %)	Fresh air (19.9 %)		*Cultural forest values* (childhood memories in forest, nostalgia, proverbs) (0.9 %)
3. Farming (land for farming, various farming practices) (40.3 %)	Governmental revenues (8.0 %)	Wild animals (17.7 %)		*Spirituality* and inner peace (0.4 %)
4. Medicinal plants and disease prevention (32.3 %)	Plantations and income (6.2 %)	Standing trees, old trees—more than timber (7.5 %)		
5. Household items (ropes, lianas, cooking utensils, mats) (27.9 %)	Source of employment (3.1 %)	Protective functions (storm and flooding) (6.6 %)		
6. Firewood (14.6 %)	Tourism (3.1 %)	Natural habitats (3.1 %)		
7. Shelter (roofing, building) (7.1 %)	Community revenues (2.2 %)	Soil fertility (1.3 %)		
8. Charcoal (1.3 %)	Minerals (1.8 %)	Biodiversity (0.4 %)		
9. Village protection (1.3 %)	Furniture (1.8 %)	Sunlight (0.4 %)		
10. Fodder (0.4 %)	Paper (0.4 %)	Biodiversity (0.4 %)		

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